RADAR ANALYSIS REPORT

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RADAR ANALYSIS REPORT

1. INTRODUCTION

1.1 GENERAL

This report presents the first analysis of the radars and associated equipment used for recording of high-speed magnetic tape data for Bermuda (BDA), Carnarvon (CRO), Canary Island (CYI), Hawaii (HAW), White Sands (WHS), and Wallops Island (WLP). Future reports will be generated on a monthly or mission basis (whichever is more appropriate).

1.2 EXPLANATION OF APPENDICES

1.2.1 Appendix A contains the analysis charts for all stations.

1.2.2 Appendix B contains the running average analysis charts for all stations.

1.2.3 Appendix C contains a discussion of the method used in analyzing the data.

1.3 REPORTING PERIOD

The period of time covered by this report includes the following missions:

NCG 428 Pioneer-B launched August 17, 1966/1520Z

NCG 431 Lunar Orbiter-A launched August 10, 1966

NCG 636 GTA-11 launched September 12, 1966/1442Z

NCG 642 GTA-9 launched June 3, 1966

NCG 654 GTA-10 launched July 18, 1966/2220Z

NOTE

Tapes used from each mission were selected without reference to revolution. Inquiries as to the revolution number should be directed to the data service office. Tape numbers shown in this report are those assigned by the data service office.

2. HISTORY

2.1 PURPOSE

2.1.1 Since many stations in the Manned Space Flight Network (MSFN) record high-speed radar data on magnetic tape, it was decided to standardize all tapes.

2.1.2 An analysis of the radars and their associated equipment would be made based on these tapes.

a. For the radar analysis, station recording formats were obtained and separate 7094 programs were written for each station.

b. The output of each program was a standardized tape, if it was desired, and an analysis statement. These statements (table 1) were tabulated for Appendix A of this report.

2.2 PROCEDURE

2.2.1 The recording process at each station is as follows:

a. The raw or systematic error corrected data is obtained.

b. The data is processed through a data formatter*.

c. Data is recorded on high-speed magnetic tape in either high (556 BPI) or low (200 BPI) density at a rate of 10 or 20 samples per second.

d. End of file marks are utilized to indicate end of tape, end of a pass, or the end or recording.

e. In this report, pass, file, or revolution means data that is recorded from the start of tape to the first end of file mark, or data that is recorded between end of file marks. Each raw data or standardized tape may contain more than one file of data.

NOTE

In future reports this section will be used to discuss the past history of the station analysis. A review of each station's problems will be presented for comparison with the new analysis. Outstanding problems will be discussed in full, including past deficiencies that have been corrected but are considered vital in determining the quality of data received from each station. Also, station and past missions comparisons will be discussed in future reports.

* The data formatter may differ at each station. Some stations utilize a computer, while others use a hard wire unit. Due to the inability of some stations to readily change recording formats, the value of a standardizing program can be seen. With a standard format, each data user has only to write one program to cover all MSFN stations.

3. DATA ANALYSIS SUMMARY

3.1 PASS BY PASS ANALYSIS

3.1.1 BERMUDA (BDA). No data is available at this time since the recording equipment was being installed during this reporting period.

3.1.2 CARNARVON (CRO). Refer to Appendix A, page A-1.

3.1.2.1 Tapes 431 CRO 1-6, 1-4, 1-3, 1-2; 428 CRO 1-2, 1-1; 654 CRO 1-63, 1-61, 1-59, 1-57, 1-56, 1-55, 1-54.

A discontinuity in on-track recording of range data is responsible for the extremely large values of FPQ-6 Beacon rms range error for these tapes. It is indicated by data received that this is caused by the digital range machine dropping or adding a high order bit. This results in one or more very large, or small, values of range being recorded. This usually occurs just after entering on-track mode and results in an erroneous range data output for .1-1 sec. The problem is not serious due to the small loss of data. However, it does appear to be abnormal and could result in miscalculations at the user end of the data output.

3.1.2.2 Tapes 654 CRO 1-60, 1-65, 1-62, 1-57, 1-56, 1-55, 1-37, 1-23, 1-22, 1-19, 1-8, 1-7.

The large CRO FPQ-6 azimuth rms values for these tapes are due to an analysis program error. This error occurs when the tracked target passes through 360 deg of azimuth and does not reflect on equipment problem. This program deficiency will be corrected by the next reporting period.

3.1.2.3 Tape 654 CRO 1-63.

This tape had a large number of bad range points because of a repeated loss of signal during the pass. It is not a congenital equipment problem.

3.1.3 CANARY ISLAND (CYI). Refer to Appendix A, page A-3.

3.1.3.1 Tape 654 CYI 1-20-3, 1-20-9.

The azimuth servo unit is assumed to be improperly functioning when a large number of bad azimuth points are associated with inconsistent rms errors recorded during high elevation angles.

3.1.4 HAWAII (HAW). Refer to Appendix A, page A-4.

3.1.4.1 Tapes 642 HAW 1-123-3, 1-101-2; 654 HAW 1-4-1, 1-2-2, 1-2-3, 1-1-3, 1-1-5.

A discontinuity in range recording is responsible for the large values of Beacon rms range error on these tapes. It is assumed that this is caused by the encoders dropping a bit. The result of this is that one or more very large, or small, values of range data being recorded. Since this is not an AOS-LOS function or an analysis difficulty, no conclusion of a possible range servo problem can be determined at this time.

3.1.4.2 Tapes 636 HAW 1-18-6; 642 HAW 1-101-3; and 654 HAW 1-6-4.

The large number of bad range points were caused primarily by repeating range values at various intervals throughout the pass. Because of this repetition, a gross change in range resulted when the next correct value was recorded. As shown in Appendix A, this occurred many times resulting in a serious degradation of the HAW FPS-16 range data.

3.1.4.3 Tapes 654 HAW 1-6-1, 1-5-4.

a. On these tapes large values in range, azimuth and elevation Beacon rms errors recorded were caused by a loss of track time. This resulted in a gross change in range when the next value was recorded. It is apparent that a mechanical problem in recording data and not a radar data problem caused this. For periods of time up to 36 sec, data was not recorded. The cause of this is being investigated.

b. The large number of bad range points were caused by the range machine recording values just out of the bad range limit (Appendix C page C-1). During a continous segment of the pass. Due to the nature of the vehicle pass over the site the "bad range point" criteria was exceeded. Range rms was not materially affected during this period. This indicates that there are no radar problems.

3.1.4.4 Tapes 642 HAW 1-101-3; and 654 HAW 1-6-3, 1-5-1, 1-5-6.

The large number of bad azimuth points were caused by recording azimuth values just out of the bad azimuth limit (Appendix C page C-1) during a continuous high elevation segment of the pass. Once again rms values were normal. This indicates that there are no equipment difficulties.

3.1.5 WHITE SANDS (WHS). Refer to Appendix A, page A

3.1.5.1 Tape 654 WHS 1-4.

The azimuth bad points were caused by a drop-out of the 3200 mil bit (msb) and the 100 mil bit. This caused the azimuth beacon rms error to be very large.

3.1.5.2 Tape 654 WHS 1-1.

This tape was not available for further analysis at the time of this report. It is assumed, however, that the encoders dropped a bit resulting in a very large, or small, value of range data being recorded. It is assumed that the azimuth problem is the same as on tape 654 WHS 1-4.

3.1.6 WALLOPS (WLP). No data is available at this time since the station is not recording on magnetic tape.

3.2 NETWORK ANALYSIS

3.2.1 Summary figures tabulated in Appendix B are not surprising. The FPQ-6 radar performance is, as expected, superior to the other types of radars. Preliminary study indicates that the FPQ-6 radar, in the skin track mode, performs on an equivalent basis to the FPS-16 radar, in the beacon mode. On the average,data from two FPS-16's and one FPQ-6 are well within original acceptance specifications and are operating close to their design limits.*

The performance of the CYI MPS-26 is somewhat below optimum. At present radar engineers are investigating the situation. Future reports should indicate an inprovement.

*This does not imply that radar "accuracy" is excellent, since only one source of error, rms noise, is considered in this report. Calibration, geodetic location, timing, and other "biases" are not being considered.

APPENDIX A

RADAR ANALYSIS CHARTS

1. CARNARVON
2. CANARY ISLANDS
3. HAWAII
4. WHITE SANDS

CARNARVON

		RANGE			AZ			EL			TRACK TIME	
		SKIN	BEACON	BAD	SKIN	BEACON	BAD	SKIN	BEACON	BAD		
MISSION	DAY	RMS	RMS	PTS	RMS	RMS	PTS	RMS	RMS	PTS	TIME	DES
654 CRO-1-6Ø	206		1.7	0		3.44	0		.02	0	545.9	0
654 CRO-1-67	206	2.6		1	.05		0	.06		0	322.3	0
654 CRO-1-66	205	1888.3		5*	.03		0	.04		0	479.7	0
654 CRO-1-65	205		1059.4	2		2.35	0		.02	0	565.5	0
654 CRO-1-64	205	556		2*	.03		0	.04		0	540.3	0
654 CRO-1-62	205	3.9		0*	3.3		0	.03		0	579.5	0
431 CRO-1- 7	222		1.6	0		.03	0		.02	0	1191.0	0
431 CRO-1- 6	222		27434	7		.05	0		.03	0	1061.6	0
431 CRO-1- 5	222		1.6	0		.05	0		.03	0	1194.2	0
431 CRO-1- 4	222		790.8	2		.02	0		.02	0	1136.9	0
431 CRO-1- 3	222		8533	1		.05	0		.04	0	1127.8	0
431 CRO-1- 2	222		35499	7		.05	0		.03	0	825.8	0
431 CRO-1- 1	222		1.7	0		.03	0		.02	0	1191.8	1
428 CRO-1- 2	229		1062	1		.02	0		.03	0	847.5	0
428 CRO-1- 1	229		2540	5		.03	0		.03	0	738.2	0
654 CRO-1-70	200		3.39	0		.01	0		.05	0	164.2	0
654 CRO-1-68	206		1.7	0		.03	0		.02	0	545.9	0
654 CRO-1-63	204		3515	20		.04	0		.06	0	345.4	1
654 CRO-1-61	204		2010	4		.03	0		.04	0	600.8	0
654 CRO-1-59	204		3186	3		.03	0		.05	0	381.3	0
654 CRO-1-57	204		1184	2		3.7	0		.03	0	506.6	0
654 CRO-1-56	202		973.1	4		3.1	0		.03	0	618.1	1
654 CRO-1-55	202		1060	4		3.3	0		.02	0	567.7	0
654 CRO-1-54	202		1018	1		1.6	1		.02	0	1177.0	0
		2.6	89875.99	64	.05	17.96	1	.06	.61	0	15655.50	

*NOT USED IN AVERAGE

CARNARVON (cont.)

		RANGE			AZ			EL			TRACK TIME	
		SKIN	BEACON	BAD	SKIN	BEACON	BAD	SKIN	BEACON	BAD		
MISSION	DAY	RMS	RMS	PTS	RMS	RMS	PTS	RMS	RMS	PTS	TIME	DES
654 CRO-1-52	202		1080	3		.02	0		.03	0	558.0	0
654 CRO-1-51	202		1014	4		.02	0		.03	0	593.4	0
654 CRO-1-37	200		1161	1		3.6	0		.02	0	533.9	0
654 CRO-1-36	202		5313	6		.03	0		.04	0	471.6	0
654 CRO-1-25	200	907		1	.05		0	.06		0	330.0	0
654 CRO-1-24	200	4.26		3	.04		0	.06		0	231.6	0
654 CRO-1-23	200	3.14		0	7.35		0	.05		0	257.3	0
654 CRO-1-22	202		6495	7		8.1	0	.05		0	247.5	0
654 CRO-1-21	201		67255	26		.02	0		.03	0	573.9	0
654 CRO-1-20	201	2135		4	.06		0	.09		0	280.5	1
654 CRO-1-19	201		1272	1		3.9	0		.02	0	472.4	0
654 CRO-1- 8	200		12.16	1		4.9	0		.03	1	387.3	2
654 CRO-1- 7	199		1796	4		3.7	0		.03	0	506.8	3
654 CRO-1- 6	199		4021	6		.02	0		.02	0	524.8	0
		3049.40	89419.16	67	7.50	24.31	0	.31	.25	1	5969.00	
		2.60	89875.99	64	.05	17.96	1	.06	.61	0	15655.50	
	TOTAL	3052.00	179295.15	131	7.55	42.27	1	.37	.86	1	21624.50	
	AVERAGE	610.40	6643.17	1.8/ 4.06	1.51	1.71	.03	.06	.03	.03	617.81	

CANARY ISLANDS

		RANGE			AZ			EL				
		SKIN	BEACON	BAD	SKIN	BEACON	BAD	SKIN	BEACON	BAD	TRACK TIME	
MISSION	FILE	RMS	RMS	PTS	RMS	RMS	PTS	RMS	RMS	PTS	TIME	DES
654 CYI-1-20	2		122.4	48		.39	1		.47	0	596.0	0
654 CYI-1-20	3		139.4	44		.23	6		.27	2	476.4	0
654 CYI-1-20	4		84.3	23		.33	88		.34	3	509.0	0
654 CYI-1-20	5		109.6	37		.27	1		.34	0	534.6	0
654 CYI-1-20	7		44.1	13		.08	0		.08	0	549.8	0
654 CYI-1-20	9		44.5	10		.65	17		.71	2	492.6	0
654 CYI-1-20	10		54.5	12		.12	0		.20	0	496.2	0
654 CYI-1-20	11		36.1	18		.17	0		.15	3	936.2	0
	TOTAL	0	634.90	205	0	2.24	113	0	2.56	10	4590.80	
	AVERAGE	0	79.37	25.62	0	.28	14.12	0	.32	1.25	573.85	

HAWAII

MISSION		DAY	RANGE SKIN RMS	RANGE BEACON RMS	RANGE BAD PTS	AZ SKIN RMS	AZ BEACON RMS	AZ BAD PTS	EL SKIN RMS	EL BEACON RMS	EL BAD PTS	TRACK TIME	TIME DES
654 1-5	1	199		6.90	2		.07	111		.09	0	412.3	0
654 1-5	2			4.76	1		.05	0		.05	9	485.4	1
654 1-5	4			315.6	28		.20	1		.09	1	498.3	2
654 1-5	5			9.35	6		.06	0		.05	0	553.1	3
654 1-5	6			7.9	5		.04	85		.05	0	633.4	4
654 1-4	1	199		101.30	1		.11	1		.10	1	564.3	1
654 1-4	2			7.76	4		.03	0		.03	0	664.3	3
654 1-4	3			12.53	7		.05	0		.04	0	641.8	4
654 1-4	4			12.46	7		.03	0		.04	0	492.7	4
654 1-3	1	199		7.40	4		.05	0		.06	0	574.7	2
654 1-3	2			5.17	3		.03	0		.04	0	476.3	2
654 1-3	3			1.94	0		.06	0		.05	0	515.8	0
654 1-3	4			9.36	7		.04	0		.04	0	658.3	3
654 1-3	5			9.93	7		.06	0		.05	0	654.0	6
654 1-2	1	199		4.05	2		.04	0		.05	0	615.1	2
654 1-2	2			218.75	3		.17	2		.13	2	562.3	3
654 1-2	3			142.79	2		.04	0		.06	1	641.3	2
654 1-2	4			4.15	1		.05	0		.04	0	589.2	2
654 1-1	1	199		3.35	1		.06	0		.04	0	471.1	1
654 1-1	2			11.88	6		.05	0		.05	0	455.9	3
654 1-1	3			73.46	3		.05	0		.05	0	477.2	2
654 1-1	4			7.38	20		.06	0		.03	0	474.6	6
654 1-1	5			3519.45	3		.05	0		.04	0	346.2	0
428 1-1	1	229		8.56	7		.07	0		.05	0	631.8	5
428 1-1	2			9.45	2		.05	0		.03	0	408.5	4
			0	4515.63	137	0	1.57	200	0	1.35	14	13407.90	

HAWAII (cont)

		RANGE			AZ			EL				
		SKIN	BEACON	BAD	SKIN	BEACON	BAD	SKIN	BEACON	BAD	TRACK	TIME
MISSION	DAY	RMS	RMS	PTS	RMS	RMS	PTS	RMS	RMS	PTS	TIME	DES
636 1-18 1	260		4.38	0		.1	0		.1	0	158.7	0
636 1-18 2			7.33	2		.1	0		.1	0	160.2	1
636 1-18 3			5.03	1		.07	0		.05	0	379.9	2
636 1-18 4			4.60	1		.02	0		.02	0	285.8	0
636 1-18 5			4.22	0		.13	0		.04	0	256.7	0
636 1-18 6			9.71	30		.07	0		.05	0	275.4	2
642 1-123 1	156		11.67	7		.04	0		.03	0	559.8	4
642 1-123 2			10.32	5		.04	0		.04	0	477.1	4
642 1-123 3			2345.	1		.02	0		.03	0	518.7	1
642 1-123 4			2.05	0		.03	0		.03	0	554.1	1
642 1-123 5			3.82	1		.04	0		.04	0	539.8	1
642 1-101 1	156		11.31	4		.05	0		.04	0	547.3	3
642 1-101 2			1498.	6		.03	0		.03	0	437.8	6
642 1-101 3			14.54	16		.09	113		.06	0	539.8	3
642 1-101 4			10.12	7		.04	0		.03	0	472.9	6
642 1-101 5			16.05	10		.04	0		.04	0	518.1	8
654 1-37	199		11.28	5		.04	0		.03	0	364.2	3
654 1-6 1	199		117.88	5		.17	1		.09	1	684.8	3
654 1-6 2			7.26	22		.05	0		.07	0	633.3	4
654 1-6 3			7.60	4		.04	97		.05	0	673.6	5
654 1-6 4			63.56	10		.05	0		.04	0	623.2	4
			4065.73	132		1.26	211		1.01	1	11737.70	
			4515.63	137		1.57	200		1.35	14	13407.90	
TOTAL			8581.36	269		2.83	411		2.36	15	25145.60	
AVERAGE			187.42	5.84		.06	8.93		.05	.32	546.64	

WHITE SANDS

	RANGE			AZ			EL				
MISSION DAY	SKIN RMS	BEACON RMS	BAD PTS	SKIN RMS	BEACON RMS	BAD PTS	SKIN RMS	BEACON RMS	BAD PTS	TRACK TIME	TIME DES
654 WHS 1-7		3.1	2		.03	2		.04	2*	$-.13 \times 10^{6}$	2
654 WHS 1-6		1.4	2		.03	2		.03	2*	$.9\text{?} \times 10^{5}$	1
654 WHS 1-5		3.0	0		.03	0		.03	0	1003.1	4
654 WHS 1-4		3.6	35		3.6	14		.03	0*	$-.11 \times 10^{5}$	38
654 WHS 1-3		14.3	1		.03	0		.03	0*	$.28 \times 10^{7}$	1769
654 WHS 1-2		55	0		.06	0		.04	0	397.7	994
654 WHS 1-1		52.8	2		.86	4		.09	1	436.9	1094
TOTAL	0		42	0	4.64	22	0	.29	5	1837.70	
AVERAGE	0	19.03	6	0	.66	3.14	0	.04	.71	262.53	

*NOT USED IN AVERAGE (TIME)

APPENDIX B

RUNNING AVERAGES OF RADAR ANALYSIS

APPENDIX B - Running Averages of Radar Analysis

STATION/EQUIPMENT	SKIN AVG. RMS/PASS			BEACON AVG. RMS/PASS			SKIN AVG. BAD PTS/PASS			BEACON AVG. BAD PTS/PASS			TRACK AVG.	TRACK TOTAL	REPORT NUMBER
	RANGE YARDS	AZ MILS	EL MILS	RANGE YARDS	AZ MILS	EL MILS	RANGE YARDS	AZ MILS	EL MILS	RANGE YARDS	AZ	EL	TIME SECS	TIME SECS	1
BDA/FPS-16	(No Data Available)														
BDA/FPQ-6	(No Data Available)														
CRO/FPQ-6	610.40	1.51	.06	6643.17	1.71	.03	1.8	0	0	4.06	.03	.03	617.81	21624.50	
CYI/MPS-26	0	0	0	79.37	.28	.32	0	0	0	25.62	14.12	1.25	573.85	4590.80	
HAW/FPS-16	0	0	0	187.42	.06	.05	0	0	0	5.84	8.93	.32	546.64	25145.60	
WHS/FPS-16	0	0	0	19.03	.66	.04	0	0	0	6.00	3.14	.71	262.53	1837.70	
WLP/FPQ-6	(No Data Available)														
	AVG. = (Running Average Last Report Plus Average This Report)/Number of Reports														
CRO/FPQ-6	*2.22		*.05	*1.74	*.03	*.03									
HAW/FPS-16				*7.69	*.06	*.05									
WHS/FPS-16				*5.45	*.04	*.04									
*Corrected Running Averages															

APPENDIX C

STANDARDIZATION AND ANALYSIS OF RADAR DIGITAL MAGNETIC TAPES

APPENDIX C

1. METHOD

1.1 One record of data, in the form of range, azimuth, AGC, etc., is read into storage by a program from a raw radar magnetic tape.

1.2 Programmed operations in IBM Fortran Assembly Program (FAP) language translate the data to a more usable form. It then transfers program control to a Fortran routine which analyzes the data record and stores the results.

1.3 Program control is then transferred back to the FAP routine where one more data record is read into storage.

1.4 The procedure is repeated until that file is complete.

1.5 When the file is completed, a printout sheet containing the accumulated analysis is outputted. A sample of this output is shown in table 1. The charts shown in Appendix A are drawn from these analysis sheets.

2. DEFINITIONS OF PARAMETERS USED IN APPENDICES A AND B

2.1 SKIN RMS - BEACON RMS

When 100 continuous, good, on-track data records are accumulated, the rms error for the 100 point arc is determined for range, azimuth, and elevation. The variant difference method, which basically consists of making a calculation based on second difference quantities of range, azimuth, and elevation, is used to determine rms error. (The equation for determining this is given as Figure 1.) Individual 100 point rms values are averaged over one file of raw data to produce the skin/beacon rms values used in Appendix A.

$$RMS^2 = \frac{\Sigma_1^{N-n}[\Delta^n ej]^2}{[N-n]\frac{(2n)!}{(n!)^2}}$$

Where:

$\Delta^n ej$ = n^{th} difference in e (corresponding to j^{th} point)

n = order of difference

N = number of points

Figure 1 - RMS Error Equation

2.2 BAD POINTS

Bad points, determined in-track, exist if the first difference for range is greater than 1,000 yards, and if the first difference for azimuth and elevation is greater than 8.888 mils. The total number of bad points that will occur in one file of data during on-track mode is shown in Appendix A.

2.3 TRACK TIME

Track time is obtained by summing the first differences of on-track time for one file of data.

2.4 TIME DISCREPANCY

Time discrepancy checks are obtained by comparing first differences of on-track time. If they are unequal, the last time stored before the check routine is assumed to be responsible for the inconsistency.

2.5 RUNNING AVERAGE

An average is determined for each column of values recorded in Appendix A. This average is then added to the recorded running averages of the previous report. These sums are then averaged and recorded in Appendix B as the running average.

NOTE

Due to the difference between skin and beacon tracked data, passes that contain a sampling of both were not used in the analysis.

Table 1. Radar Data Magnetic Tape Quality Statement

HILLINGTON/GUZIK - ADVANCED TECHNIQUES GROUP

TAPE IDENTIFICATION STATION CRO MISSION 715 VEHICLE NO. 3 DAY NO. 211 REV NO. 86

TOTAL ON TRACK TIME = 0.41914999E 03SECONDS	MAXIMUM ELEVATION = 0.12169556E 04MILS
AVERAGE RMS RANGE ERROR = 0.14443303E 04YDS	MINIMUM RANGE = 0.40792968E 05YDS 0.50666435E 08
AVERAGE RMS AZTH ERROR = 0.45020218E 01MILS	MAXIMUM S/N (BEAC)= 0.83945312E 01
AVERAGE RMS ELEV ERROR = 0.15838975E-01MILS	MINIMUM S/N (BEAC)=-0.77187499E 01
AVERAGE S/N (BEAC) =-0.32806159E 01	MAXIMUM S/N (SKIN)= 0.74312500E 02
AVERAGE S/N (SKIN) = 0.25528377E 02	MINIMUM S/N (SKIN)=-0.13578124E 02
NUMBER OF AOS TIMES = 4	NUMBER OF BAD RANGES = 1
NO. OF TIME DISCREPANCIES = 0	NUMBER OF BAD AZIMUTHS = 0
NUMBER OF SKIN TRACKS = 8256	NUMBER OF BAD ELEVATIONS = 0
NUMBER OF BEACON TRACKS = 135	NO. OF ICO PT. ARCS USED = 83

TIMES BELOW ARE IN MILLISEC TAPE LOS TIME NO. 5 IS END OF TAPE TIME

TAPE AOS TIMES	TAPE LOS TIMES	TIME DISCREPANCIES	BAD RANGE TIMES	BAD AZ TIMES	BAD EL TIMES
0.50183585E 08	0.50230585E 08	0.	0.50666435E 08	0.	0.
0.50100485E 08	0.50671535E 08	0.	0.	0.	0.
0.50687535E 08	0.50688585E 08	0.	0.	0.	0.
0.50744535E 08	0.50744985E 08	0.	0.	0.	0.
0.	0.50821035E 08	0.	0.	0.	0.

STANDARDIZED DATA TAPE FORMAT-

BINARY HIGH DENSITY 13 WORD RECORDS 36 BIT WORDS CAPABLE OF BEING READ WITH FORTRAN
NOTE- FIRST WORD OF EACH STD TAPE RECORD IS FORTRAN COMPATIBILITY WORD- NOT RADAR DATA

WORD	FUNCTION	UNITS	WORD	FUNCTION	UNITS
1	FORTRAN WORD				
2	ID WORD		8	ELEVATION	MILS
3	TIME	MILLISEC	9	ELEV RATE	
4	RANGE	YDS	10	AGC	VOLTS
5	RANGE RATE		11	STATION STATUS WORD	
6	AZIMUTH	MILS	12	OPEN	
7	AZTH RATE		13	OPEN	

COMPLETED A TAPE